

**CLAIMS**

What we claim is:

1 1. A data storage device comprising:  
2 a probe tip mounted on a suspension mechanism;  
3 a data storage layer;  
4 at least one conducting layer wherein a capacitance is formed between the  
5 suspension mechanism and the at least one conducting layer; and  
6 a sensor for sensing a change in the capacitance based on a displacement of the  
7 probe tip due to the presence of a bit.

1 2. The data storage device of claim 1 wherein the data storage layer is in contact  
2 with the probe tip.

1 3. The data storage device of claim 2 wherein the data storage layer includes the bit  
2 and the bit comprises at least one of a pit or a protrusion.

1 4. The data storage device of claim 1 wherein the data storage layer comprises a  
2 polymer material.

1 5. The data storage device of claim 1 wherein the conducting layer comprises a  
2 conducting thin film.

1 6. The data storage device of claim 5 wherein the conducting thin film comprises at  
2 least one of a deposited metal film of Mo, Cu, TA.

1 7. The data storage device of claim 1 wherein the conducting layer comprises a  
2 conducting substrate.

1 8. The data storage device of claim 7 wherein the conducting substrate comprises a  
2 doped silicon material.

1 9. The data storage device of claim 1 wherein the suspension mechanism includes a  
2 flexible cantilever.

1 10. The data storage device of claim 9 wherein the capacitance is formed on at least  
2 one side of the flexible cantilever.

1 11. The data storage device of claim 9 wherein a first capacitance is formed on a first  
2 side of the flexible cantilever and a second capacitance is formed on a second side of the  
3 flexible cantilever.

1 12. The data storage device of claim 11 wherein the change in capacitance comprises  
2 a difference in capacitance between the first capacitance and the second capacitance.

1 13. A method of reading data from a data storage device comprising:  
2 suspending a probe tip over a data storage layer via a suspension mechanism;  
3 providing at least one conducting layer wherein a capacitance is formed between  
4 the suspension mechanism and the at least one conducting layer; and  
5 sensing a change in the capacitance based on a displacement of the probe tip due  
6 to the presence of a bit.

1 14. The method of claim 13 wherein the data storage layer comprises a polymer  
2 material.

1 15. The method of claim 13 wherein the at least one conducting layer comprises a  
2 conducting thin film.

1 16. The method of claim 15 wherein the conducting thin film comprises at least one  
2 of a deposited metal film of Mo, Cu, TA

1 17. The method of claim 13 wherein the at least one conducting layer comprises a  
2 conducting substrate.

1 18. The method of claim 17 wherein the conducting substrate comprises a doped  
2 silicon material.

1 19. The method of claim 13 wherein the suspension mechanism further includes a  
2 flexible cantilever and the act of providing at least one conducting layer further  
3 comprises providing a conducting layer within the suspension mechanism whereby a  
4 capacitance is formed between the conducting layer and the flexible cantilever.

1 20. The method of claim 13 wherein the suspension mechanism further includes a  
2 flexible cantilever and the act of providing at least one conducting layer includes  
3 providing a first conducting layer on a first side of the flexible cantilever and a second  
4 conducting layer on a second side of the flexible cantilever wherein a first capacitance is  
5 formed on the first side of the flexible cantilever and a second capacitance is formed on  
6 the second side of the flexible cantilever.

1 21. The method of claim 20 wherein the act of sensing a change in capacitance  
2 comprises sensing a difference in capacitance between the first and second capacitance.

1 22. The method of claim 13 wherein the data storage layer includes the bit and the bit  
2 comprises at least one of a pit or protrusion.

1 23. A computer system comprising:  
2 a central processing unit; and  
3 a data storage device coupled to the central processing unit comprising:  
4 a probe tip mounted on a suspension mechanism;

5                   a data storage layer;  
6                   at least one conducting layer wherein a capacitance is formed between the  
7                   suspension mechanism and the at least one conducting layer; and  
8                   a sensor for sensing a change in the capacitance based on a displacement of the  
9                   probe tip due to the presence of a bit.

1   24.   A data storage device comprising:  
2                   a probe tip mounted on a flexible suspension mechanism;  
3                   at least one capacitor coupled to the flexible suspension; and  
4                   a sensor for sensing a change in capacitance of the at least one capacitor based on  
5                   a displacement of the probe tip due to the presence of a bit.